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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Art Unit	:	2863
Examiner	:	Xiuqin Sun
Appln. No.	:	09/838,905
Applicant	:	Kenichiro Kobayashi
Filing Date	:	April 20, 2001
Confirmation No.	:	1673
For	:	METHOD AND APPARATUS TO MEASURE AMOUNT OF MOVEMENT USING GRANULAR SPECK PATTERN GENERATED BY REFLECTING LASER BEAM

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPELLANT'S BRIEF (37 CFR §1.192)

This brief is in furtherance of the Notice of Appeal, filed in this case on June 2, 2003.

The fees required under §1.17(f), and any required petition for extension of time for filing this brief and fees therefor, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief is transmitted in triplicate. (37 CFR §1.192(a)).

This brief contains these items under the following headings, and in the order set forth below (37 CFR §1.192(c)):

I. Real Party in Interest

II. Related Appeals and Interferences

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The final page of this brief bears the attorney's signature.

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TABLE OF AUTHORITY

Case Authority

I. Real Party in Interest

The real party in interest in this application is Kabushiki Kaisha Toyoseikiseisakusho, the assignment to which was recorded at Reel 011915, Frame 0004.

II. Related Appeals and Interferences

There are no related appeals or interferences pending during this application.

III. Status of Claims

Claims 1-17 are pending in this application and are the subject of this appeal. All appealed claims are finally rejected.

IV. Status of Amendments

An Amendment After Appeal was filed on August 1, 2003. The Amendment After Appeal addressed only 35 U.S.C. §112 items. The pending claims listed in Appendix A include this amendment.

V. Summary of the Invention

As described in the specification portion of the application (pages 1-12), and illustrated in the related figures (Figs. 1-7), the invention recited in the finally rejected claims relates to a method and apparatus to measure an amount of movement using a granular speck pattern generated by a reflecting laser beam.

As a matter of background, objects irradiated with a laser beam will reflect a granular speck pattern due to positive and negative interference of scattering light being reflected from the object because of irregularities in the object's surface. Heretofore, one non-contact method for measuring movement or distortion of an object included irradiating the objected vertically with a laser beam and measuring the granular speck pattern with a pair of unidimensional sensors at an angle of 45° about the normal line. An output of the unidimensional sensors is used as a reference signal to observe movement of the granular speck pattern as the surface of the object is

moved or distorted. Such movement is photoelectrically detected at two points and a differential movement between these two points is obtained to automatically eliminate a rigid body movement component. This is called a cross correlating method of determining distortion. In another method, a granular speck pattern generated by a laser beam reflecting off an object is projected onto a frosted glass screen in a darkroom. The projected pattern is picked up by a digital camera or the like and a granular speck is selectively extracted by computer and the amount of movement of the object in a plane is determined on the basis of an amount by which the granular speck moves. In the prior methods, high accuracy measurements of the optical parts and the optical system are required. Furthermore, when using the first method described above, the method of determining movement can be very complicated and troublesome when a correlative peak value and a reference signal value is lower than a threshold value. Furthermore, when using the frosted glass, a darkroom is essential (see the present specification, page 1, lines 20-28 and page 2, lines 1-15).

A first aspect of the present invention is to provide a lensless method for measuring the amount which an object 1 to be measured has moved in a plane and back-and-forth using a granular speck pattern 5 generated by a reflected laser beam in non-contact fashion. The method includes, among other things, irradiating an object 1 to be measured with a laser beam 6, directly detecting the granular speck pattern 5 generated by the reflecting laser beam by a detector 9 and using the detected speck pattern 5 as an index. The method further includes moving the object 1 toward or away from the detector 9, calculating the amount of movement of the object 1 based upon the movement of a new granular speck pattern 5 corresponding to the moved position of the object 1 with respect to said index, and displaying a result of the calculation as a numerical value of the measured amount of movement (see the present specification, page 9, lines 13-30 and page 10, lines 1-6).

Another aspect of the present invention includes providing a lensless apparatus for measuing an amount which an object 1 to be measured has moved in a plane and back and forth using a granular speck pattern 5 generated by a reflecting laser beam. The apparatus includes, among other things, a laser projector 7 to generate a granular speck pattern 5

corresponding to a rough surface 2 of an object 1 to be measured, a line sensor 9 to directly pick up without a lens said granular speck pattern 5 used as an index, an A/D converter 12 coupled to said line sensor 9 to convert an analog signal supplied from said line sensor 9 to a digital signal, a processing unit 13 coupled to the A/D converter 12 to calculate the amount of movement of said object 1 toward and away from said sensor 9 on the basis of movement of the granular speck in said pattern with respect to a change in the pixel interval of said granular speck pattern 5 picked up by said line sensor 9 and represented by said A/D converted signal, and a display 14 coupled to said processing unit 13 to display the amount of movement calculated by said processing unit 13 (see the present specification, page 5, lines 19-30 and page 6, lines 1-5).

Yet another aspect of the present invention is to provide a lensless apparatus for measuring the amount which an object 1 to be measured has moved in a plane and back and forth using a granular speck pattern 5 generated by a reflecting laser beam. The apparatus includes, among other things, a laser projector 7 for generating a granular speck pattern 5 corresponding to the surface 2 of an object 1 to be measured, a line sensor 9 positioned to detect directly without a lens said granular speck pattern 5 as an index, and an electrical circuit coupled to said line sensor 9 for calculating the amount of movement of said object 1 toward and away from said sensor 9 on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern 5 picked up by said line sensor 9 and displaying the amount of movement calculated by said electrical circuit (see the present specification, page 5, lines 19-30 and page 6, lines 1-5).

Another aspect of the present invention is to provide a lensless method for measuring the amount which an object 1 to be measured has moved by detecting a granular speck pattern 5 reflected by a laser beam. The method includes steps of, among other things, irradiating an object 1 to be measured with a laser beam 6, directly detecting a granular speck pattern 5 generated by the reflecting laser beam by a detector 9 and using the detected pattern as an index, moving the object 1 with respect to said detector 9, calculating the amount of movement of the object 1 based upon movement of the granular speck pattern 5 corresponding to the

moved position of the object 1 with respect to said index, and displaying a result of the calculation as a numerical value of the measured amount of movement (see the present specification, page 9, lines 13-25 and page 10, lines 1-6).

In another aspect of the present invention, a lensless apparatus for measuring the amount which an object 1 to be measured has moved using a granular speck pattern 5 generated by a reflecting laser beam is provided. The lensless apparatus includes, among other things, a laser source 7 for generating a granular speck pattern 5 corresponding to a rough surface 2 of an object 1 to be measured, a line sensor 9 positioned to detect directly without a lens said granular speck pattern 5 as an index, a processing unit 13 coupled to said line sensor 9 to calculate the amount of movement of said object 1 on the basis of movement of a granular speck in said granular speck pattern 5 with respect to a pixel interval of said granular speck pattern 5 detected by said line sensor 9, and a display 14 coupled to said processing unit 13 to display the amount of movement calculated by said processing unit 13 (see the present specification, page 5, lines 19-30 and page 6, lines 1-5).

Another aspect of the present invention includes providing a lensless apparatus for measuring the amount which an object to be measured has moved in a plane and back and forth using a granular speck pattern 5 generated by a reflecting laser beam. The apparatus includes, among other things, a collimated light source 7 for generating a granular speck pattern 5 corresponding to the surface of an object 1 to be measured, a line sensor 9 positioned to detect directly without a lens said granular speck pattern 5 as an index, and an electrical circuit coupled to said line sensor 9 for calculating the amount of movement of said object 1 on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern 5 picked up by said line sensor 9 and displaying the amount of movement calculated by said electrical circuit (see the present specification, page 9, lines 13-25 and page 10, lines 1-6).

Va. Cited Prior Art

U.S. Patent No. 6,248,994 to Rose et al.

The Rose et al. 6,248,994 patent determines a method and apparatus for determining angular displacement, surface translation and twist. The Rose et al. '994 patent discloses that the method and apparatus for determining angular displacement, surface translation and twist of a cylinder 10 includes subjecting the cylinder 10 to a substantially parallel beam of substantially coherent electromagnetic radiation, subjecting a reflection 21 of the beam to a Fourier transformation using Fourier-transforming means, and measuring the reflected beam 21 transformed by the Fourier-transforming means with a sensor 18. According to the Rose et al. '994 patent, the coherent electromagnetic radiation must be substantially parallel or the determination of the angular displacement becomes dependent on the distance to the object. According to the Rose et al. '994 patent, a measurement dependent on the distance from a linear sensor to the object is undesirable (see lines 37-41 and 63-67 of column 1). Furthermore, the Rose et al. '994 patent discloses that its method and apparatus for determining angular displacement, surface translation and twist is independent of the distance of the object to the image sensor. See lines 8-13 of column 2, 18-21 of column 3, lines 66 and 67 of column 6 and line 1 of column 7. According to the Rose et al. '994 patent, the Fourier-transforming means comprises an optical Fourier-transforming device, which comprises refractive, reflective and defractive optical elements, and active liquid crystals. See lines 44-51 of column 3. The refractive and defractive optical elements are preferably lenses, which are simple and readily available. See lines 52-65 of column 3.

U.S. Patent No. 4,824,250 to Newman

The Newman 4,824,250 patent discloses a method of testing for defects using laser scanning. In the testing method disclosed by the Newman '250 patent, a beam of laser light is directed onto each point of an object and the reflected light forms a speckled pattern. While the light is directed towards a given point on the object, the object is made to vibrate. The speckled pattern is detected and recorded in a computer memory, both while the object is vibrating and

while it is stationary. If there is no defect at the point being examined, and if the amplitude of vibration is less than about one-half of the wavelength of the incident laser light, then a speckled pattern will be substantially unaffected by the vibration of the object. However, if there is a defect at that point, vibration of the object will cause the pattern to become blurred. The system disclosed in the Newman '250 patent compares the speckled pattern obtained for the vibratory and non-vibratory states. By repeating this comparison for each point on the object, the system determines where the defects on the object are located. See lines 16-54 of column 4. The Newman '250 patent discloses that the speckled pattern can be detected by a photo-diode detector array 23 or a video camera without a lens. See lines 6-15 of column 6.

U.S. Patent No. 6,424,407 to Kinrot et al.

The Kinrot et al. 6,424,407 patent discloses a method and apparatus for the non-contact optical measurement of velocity and translation. The method and apparatus for non-contact optical measurement of velocity and translation as disclosed by the Kinrot et al. '407 patent includes a source of optical radiation 14, such as a laser, which emits at least partially coherent and preferably collimated optical radiation towards a reflective grating 16 closely spaced to a surface 12. Translation of the surface 12 is measured by light reflected from the object 12 though a spatial filter, disclosed as being composed of a lens 18 and a pinhole 20, before being detected by an optical detector 22. Using homodyne or heterodyne detection of the reflected light along with any phase shifts, the optical detector 22 can determine translation of the surface 12. According to the Kinrot et al. '407 patent, a pinhole 20 or an effective pinhole is used such that, at most, a single speckle reaches the detector 22. Thus, according to the Kinrot et al. '407 patent, measurements made by the system disclosed herein are termed "speckle-free." The Kinrot et al. '407 patent discloses that its methods and apparatus are preferably used in optical mouses for computers along with other similar items.

Japanese Patent 404021255A to Omura

The Japanese 404021255A patent discloses a color picture reader including a light shield 104 used to stop first order diffraction components 6 and 8 coming from a color decomposing element 3 made of a linear blazed grading into a line sensor 4b.

U.S. Patent No. 5,864,944 to Kashiwagi et al.

The Kashiwagi et al. '944 patent discloses an apparatus and method for mounting electrical components onto a substrate 3 by picking them up with a nozzle 21a, 21b, 21c of a carriage head and properly positioning the electronic component by recognizing a position of the electronic component on the nozzle through a line-sensor 33 with an image of the electronic components held by the nozzle.

Vb. The Examiner's Rejection

Claims 1, 2, 6-8 and 12-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman and U.S. Patent No. 6,424,407 to Kinrot et al.

Claims 3, 9 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman, U.S. Patent No. 6,424,407 to Kinrot et al. and Japanese Patent 404021255A.

Claims 4, 5, 10, 11, 16 and 17 were rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman, U.S. Patent No. 6,424,407 to Kinrot et al., Japanese Patent 404021255A and U.S. Patent No. 5,864,944 to Kashiwagi et al.

VI. Issues

The issues are:

Issue 1: Whether claims 1, 2, 6-8 and 12-14 are unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman and U.S. Patent No. 6,424,407 to Kinrot et al.?

Issue 2: Whether claims 3, 9 and 15 are unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman, U.S. Patent No. 6,424,407 to Kinrot et al. and Japanese Patent 404021255A?

Issue 3: Whether claims 4, 5, 10, 11, 16 and 17 are unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman, U.S. Patent No. 6,424,407 to Kinrot et al., Japanese Patent 404021255A and U.S. Patent No. 5,864,944 to Kashiwagi et al.?

VII. Grouping of Claims

The claims are subdivided into the following groups for this appeal. The claims of each subdivided group are believed to be separately patentable since they define inventions of patentably different scopes and subject matter, as shown by the reasons given in the arguments below.

Claim 1 stands or falls alone (claim 1 is an independent claim).

Claim 2 stands or falls alone.

Claim 3 stands or falls alone.

Claims 4 and 5 stand or fall together.

Claim 6 stands or falls alone (claim 6 is an independent claim).

Claim 7 stands or falls alone (claim 7 is an independent claim).

Claims 8 and 12 stand or fall together (claim 8 is an independent claim).

Claim 9 stands or falls alone.

Claims 10 and 11 stand or fall together.

Claims 13 and 14 stand or fall together (claim 13 is an independent claim).

Claim 15 stands or falls alone.

Claims 16 and 17 stand or fall together.

VIII. Arguments

Issue 1

Whether claims 1, 2, 6-8 and 12-14 are unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman and U.S. Patent No. 6,424,407 to Kinrot et al.?

Argument

In order to establish a *prima facie* case of obviousness, three criteria must be met. M.P.E.P. § 706.02(j). Firstly, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *In re Fine*, 5 U.S.P.Q.2d 1586 (Fed. Cir. 1988). Secondly, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Thirdly, the prior art reference (or references) must teach or suggest all the claim limitations. *In re Royka*, 180 U.S.P.Q. 550 (C.C.P.A. 1974). The burden is on the Examiner to create a prima facie case of obviousness, not on the Applicant to provide reasons for patentability. See *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The Examiner has not created a prima facie case of obviousness to reject claims 1, 2, 6-8 and 12-14.

Discussion

Claim 1 defines a lensless method for measuring the amount which an object to be measured has moved in a plane and back-and-forth using a granular speck pattern generated by a reflecting laser beam in non-contact fashion. The method includes steps of irradiating an object to be measured with a laser beam, directly detecting the granular speck pattern generated by the reflecting laser beam by a detector and using the detected speck pattern as an index, moving the object toward or away from the detector, calculating the amount of movement of the object based upon the movement of a new granular speck pattern corresponding to the

moved position of the object with respect to said index, and displaying a result of the calculation as a numerical value of the measured amount of movement.

Claim 2 defines providing a lensless apparatus for measuing an amount which an object to be measured has moved in a plane and back and forth using a granular speck pattern generated by a reflecting laser beam. The apparatus includes, among other things, a laser projector to generate a granular speck pattern corresponding to a rough surface of an object to be measured, a line sensor to directly pick up without a lens said granular speck pattern used as an index, an A/D converter coupled to said line sensor to convert an analog signal supplied from said line sensor to a digital signal, a processing unit coupled to the A/D converter to calculate the amount of movement of said object toward and away from said sensor on the basis of movement of the granular speck in said pattern with respect to a change in the pixel interval of said granular speck pattern picked up by said line sensor and represented by said A/D converted signal, and a display coupled to said processing unit to display the amount of movement calculated by said processing unit.

Claim 6 defines a lensless apparatus for measuring the amount which an object to be measured has moved in a plane and back and forth using a granular speck pattern generated by a reflecting laser beam. The apparatus includes, among other things, a laser projector for generating a granular speck pattern corresponding to the surface of an object to be measured, a line sensor positioned to detect directly without a lens said granular speck pattern as an index, and an electrical circuit coupled to said line sensor for calculating the amount of movement of said object toward and away from said sensor on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern picked up by said line sensor and displaying the amount of movement calculated by said electrical circuit.

Claim 7 defines a lensless method for measuring the amount which an object to be measured has moved by detecting a granular speck pattern reflected by a laser beam. The method includes steps of, among other things, irradiating an object to be measured with a laser beam, directly detecting a granular speck pattern generated by the reflecting laser beam by a detector and using the detected pattern as an index, moving the object with respect to said

detector, calculating the amount of movement of the object based upon movement of the granular speck pattern corresponding to the moved position of the object with respect to said index, and displaying a result of the calculation as a numerical value of the measured amount of movement.

Claim 8 defines a lensless apparatus for measuring the amount which an object to be measured has moved using a granular speck pattern generated by a reflecting laser beam is provided. The lensless apparatus includes, among other things, a laser source for generating a granular speck pattern corresponding to a rough surface of an object to be measured, a line sensor positioned to detect directly without a lens said granular speck pattern as an index, a processing unit coupled to said line sensor to calculate the amount of movement of said object on the basis of movement of a granular speck in said granular speck pattern with respect to a pixel interval of said granular speck pattern detected by said line sensor, and a display coupled to said processing unit to display the amount of movement calculated by said processing unit. Claim 12 depends from claim 8.

Claim 13 defines a lensless apparatus for measuring the amount which an object to be measured has moved in a plane and back and forth using a granular speck pattern generated by a reflecting laser beam. The apparatus includes, among other things, a collimated light source for generating a granular speck pattern corresponding to the surface of an object to be measured, a line sensor positioned to detect directly without a lens said granular speck pattern as an index, and an electrical circuit coupled to said line sensor for calculating the amount of movement of said object on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern picked up by said line sensor and displaying the amount of movement calculated by said electrical circuit. Claim 14 depends from claim 13.

The prior art of record does not disclose or suggest the above noted features of claims 1, 2, 6-8 and 12-14.

In regard to the first criterion of obviousness, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings.

According to the final Office Action, "Rose et al. teach a method for measuring the amount which an object to be measured has moved in a plane and back-and-forth using a granular speck pattern generated by a reflecting laser beam in non-contact fashion...comprising steps of: irradiating an object to be measured with a laser beam...; optically picking up the granular speck pattern generated by the reflecting laser beam by a detector and using the detected speck pattern as an index...; calculating the amount of movement of the object based on the movement of a new granular speck pattern corresponding to the new position of the object with respect to said index...; and displaying a result of the calculation as a numerical value as the measured amount of movement." See paragraph 2 of pages 2-3 of the final Office Action mailed December 2, 2002. Furthermore, according to the final Office Action, the Rose et al. '994 patent does not disclose directly sensing the granular speck pattern without the use of a lens, moving the object toward and/or away from the detector or a processing unit that includes a display to display the amount of movement calculated by the processing unit. See page 4 of the final Office Action mailed February 2, 2002. The final Office Action then states that the Newman '250 patent "teaches a method for directly sensing speckled patterns in a moving object without the use of a lens" and that "[i]t would have been obvious to include the teaching of Newman's lensless sensing technique in the Rose system in order to eliminate the need of complex and expensive optical components such as lenses in measuring the movement of an object in non-contacting fashion." *Id.* Furthermore, according to the final Office Action, the Kinrot et al. '407 patent "teaches an embodiment in which non-contact optical measurement of velocity and translation is made for an object moving toward and/or away from the measurement device" and that "[i]t would have been obvious to include the teaching of the Kinrot measurement of translation in the Rose system in order to provide a method and apparatus that can detect the movement of an object toward and away from the detector in non-contacting fashion." *Id.* Finally, according to the final Office Action, "[i]t is deemed that it is a common knowledge and well known practice to use a display that is coupled to a processing unit (or a computer) for displaying the output generated by the processing unit" and that "[i]t would have been obvious to include a display

coupled to said processing unit in the Rose system in order to display the measured amount of movement of an object." However, Applicant submits that there is no suggestion or modification for combining the reference teachings as set forth in the final Office Action.

First, the Rose et al. '994 patent teaches away from directly sensing a granular speck pattern without the use of a lens. The Rose '994 patent discloses that a drawback of prior systems is that the method of determining the angular displacement of an object depends on the distance from a linear sensor to the object. See lines 37-40 of column 1. In order to overcome the deficiencies in the prior art, Rose et al. discloses a method and apparatus for measuring the angular displacement of an object independent of the distance from a sensor to the object. See lines 8-12 of column 2, lines 18-21 of column 3, lines 14-19 of column 5, lines 66 and 67 of column 6 and line 1 of column 7. The Rose et al. '994 patent discloses that their method and apparatus is able to determine the angular displacement of an object independent to the distance to the object through the use of a Fourier-transforming means. In a preferred embodiment of the invention disclosed in the Rose et al. '994 patent, the Fourier-transforming means is a lens (refractive convex, refractive cylinder, holographic, etc.). Without the use of the Fourier-transforming means as disclosed in the Rose et al. '994 patent, any determination of angular displacement of an object would be dependent on the distance from the sensor to the object. Accordingly, the Rose et al. '994 patent teaches against any modification wherein the Fourier-transforming means is not included. However, according to the final Office Action mailed December 2, 2002 and the Advisory Action mailed April 16, 2003, it would have been obvious to remove the Fourier-transforming means as disclosed in the Rose et al. '994 patent to use a lensless sensing technique as used in the Newman '250 patent. However, there is no suggestion to combine references if a reference teaches away from its combination with another source. *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Since the Rose et al. '994 patent teaches away from any combination wherein the Fourier-transforming means is removed, the Rose et al. '994 patent teaches away from a combination with the Newman '250 patent wherein the Fourier-transforming means is removed as set forth

in the final Office Action mailed December 2, 2002 and the advisory action mailed April 16, 2003.

Second, the Rose et al. '994 patent teaches away from moving an object toward and/or away from a detector. As set forth above, the method and apparatus disclosed by the Rose et al. '994 patent is advantageous because a speckle pattern can be sensed by a sensor regardless of the distance of the sensor to the object. Therefore, the Rose et al. '994 patent teaches that it is undesirable for its system and method to be able to sense a distance from a sensor to the object. Therefore, the Rose et al. '994 patent teaches against any modification that would result in a system that would result in a reading change as an object is moved towards or away from the sensor. Accordingly, the Rose et al. '994 patent teaches away from a modification that would allow the sensor to detect the movement of an object towards and away from a detector. Accordingly, the Rose et al. '994 patent teaches away from any combination with the Kinrot et al. '407 patent.

Third, since the Rose et al. '994 patent teaches away from any combination with the Newman '250 patent or the Kinrot et al. '407 patent, the Rose et al. '994 patent teaches away from any combination of the Newman '250 patent and the Kinrot et al. '407 patent.

Fourth, there is no suggestion or motivation for moving an object toward and away from a sensor. In the final Office Action mailed December 2, 2002, the rejection set forth a system that could detect the movement of an object toward and away from a detector, but did not provide a method for moving an object toward or away from a sensor. The Applicant pointed out this fact in a response to the final Office Action mailed April 2, 2003. Thereafter, in the Advisory Action mailed April 16, 2003, the Examiner stated that:

> The combination as set forth in the Office Action provides for an apparatus and method of detecting and measuring the movement of an object towards or away from a detector. It is inherent and obvious that one would move the object towards or away from the detector when operating the apparatus and method to conduct the detection for the movement. More specifically, Kinrot et al. talk about moving a surface toward or away from a measurement device in carrying out an non-contact optical measurement of velocity and translation of the surface with respect to the measurement device (col. 2, lines 48-56; col. 19, lines 53-55; col. 24, lines 20-44; col. 29, lines 16-20; col. 34, lines 36-46; col. 36, lines

> 47-51; and col. 43, line 63 to col. 4, line 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Kinrot in the Rose system in order to carry out the method for detecting the movement of an object toward and away from the detector in non-contacting fashion.

In other words, the present rejection of the claims states that it would have been obvious to modify the invention disclosed in the Rose '994 patent such that movement of the object could be detected (even though at this point the object does not move) and, since the method and apparatus disclosed in the Rose et al. '994 patent can now measure movement of the object, it is obvious to move the object. Applicant submits that this circular reasoning is not a proper motivation or suggestion for making the modification as set forth in the final Office Action and the Advisory Action.

Finally, the Kinrot et al. '407 patent discloses that the invention uses "speckle-free" detection. See lines 62-67 of column 6. There is no suggestion or motivation for using a non-speckle pattern detection means in a speckle pattern detected system as disclosed in the Rose et al. '994 patent.

Applicant notes that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. *In re Fritch,* 23 USPQ 2d 1780, 1783 (Fed. Cir. 1992); M.P.E.P. §2142. Furthermore, Applicant notes that it is impermissible within the framework of §103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art. *In re Wesslau*, 353 F.2d 238, 241, 147 USPQ 391, 393 (CCPA 1965); see also *In re Mercer*, 515 F.2d 1161, 1165-66, 185 USPQ

774,778 (CCPA 1975). Applicant respectfully asserts that the Examiner has not yet met the Examiner's burden of establishing a prima facie case of obviousness with respect to the rejected claims. Consequently, the Examiner's rejection of the subject claims is inappropriate, and should be withdrawn.

Accordingly, there is no suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings. Therefore, claims 1, 2, 6-8 and 12-14 are allowable over the Rose et al. '994 patent in view of the Newman '250 patent and the Kinrot et al. '407 patent and the Board is requested to reverse the rejection of these claims.

Issue 2

Whether claims 3, 9 and 15 are unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman, U.S. Patent No. 6,424,407 to Kinrot et al. and Japanese Patent 404021255A?

Argument

In order to establish a *prima facie* case of obviousness, three criteria must be met. M.P.E.P. § 706.02(j). Firstly, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *In re Fine*, 5 U.S.P.Q.2d 1586 (Fed. Cir. 1988). Secondly, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Thirdly, the prior art reference (or references) must teach or suggest all the claim limitations. *In re Royka*, 180 U.S.P.Q. 550 (C.C.P.A. 1974). The burden is on the Examiner to create a prima facie case of obviousness, not on the Applicant to provide reasons for patentability. See *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The Examiner has not created a prima facie case of obviousness to reject claims 3, 9 and 15.

Discussion

Claims 3, 9 and 15 depend from claims 2, 8 and 13, respectively, and since claims 2, 8 and 13 define patentable subject matter as discussed above, claims 3, 9 and 15 define patentable subject matter. Furthermore, in regard to the first criterion of obviousness, there is no suggestion or motivation either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to combine the reference teachings. As discussed above regarding claims 1, 2, 6-8 and 12-14, there is no suggestion or motivation for combining the Rose et al. '944 patent with the Newman '250 patent and the Kinrot et al. '407 patent. The arguments set forth describing the lack of suggestion or motivation for combining the Rose et al. '944 patent with the Newman '250 patent and the Kinrot et al. '407 patent apply to a combination of the Rose et al. '994 patent, the Newman '250 patent, the Kinrot et al. '407 patent and Japanese Patent 404021255A and are hereby incorporated regarding the rejection of claims 3, 9 and 15.

Furthermore, there is no suggestion or motivation for combining the teachings of Japanese Patent 404021255A to the three patents discussed above. According to the Office Action "[i]t would have been obvious to include the teachings of Omura [Japanese Patent 404021255A] light shield section in the Rose system in order to measure the amount of movement of an object in non-context fashion accurately." Japanese Patent 404021255A discloses that the light shield section 104 is used to stop first order diffraction components 6 and 8 coming from a color decomposing element 3 made of a linear blazed diffraction grading into a line sensor 4b. Since the combination of the three patents discussed above does not include a defraction grading, there is no need to prevent light defracted from entering a line sensor. Furthermore, Applicant submits that the scanning method as disclosed in the Newman '250 patent could only possibly be used in a dark room, and therefore the combination as set forth in the Office Action could only be used in a dark room. Therefore, using a light shield section 104 as set forth by Japanese Patent 404021255A would not improve the accuracy of the system set forth in the Office Action because there would be no light besides the speckled pattern in the room to be sensed. Consequently, any light shield section would not improve

the accuracy of any measurement. Accordingly, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings. Therefore, claims 3, 9 and 15 are in condition for allowance.

Accordingly, there is no suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings. Accordingly, claims 3, 9 and 15 are allowable over the Rose et al. '994 patent in view of the Newman '250 patent, the Kinrot et al. '407 patent and Japanese Patent 4040211255A and the Board is requested to reverse the rejection of these claims.

<u>Issue 3</u>

Whether claims 4, 5, 10, 11, 16 and 17 are unpatentable over U.S. Patent No. 6,248,994 to Rose et al. in view of U.S. Patent No. 4,824,250 to Newman, U.S. Patent No. 6,424,407 to Kinrot et al., Japanese Patent 404021255A and U.S. Patent No. 5,864,944 to Kashiwagi et al.?

<u>Argument</u>

In order to establish a *prima facie* case of obviousness, three criteria must be met. M.P.E.P. § 706.02(j). Firstly, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *In re Fine*, 5 U.S.P.Q.2d 1586 (Fed. Cir. 1988). Secondly, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Thirdly, the prior art reference (or references) must teach or suggest all the claim limitations. *In re Royka*, 180 U.S.P.Q. 550 (C.C.P.A. 1974). The burden is on the Examiner to create a prima facie case of obviousness, not on the Applicant to provide reasons for patentability. See *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The Examiner has not created a prima facie case of obviousness to reject claims 4, 5, 10, 11, 16 and 17 .

Discussion

In regard to the first criterion of obviousness, there is no suggestion or motivation either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to combine the reference teachings. As discussed above regarding claims 1, 2, 3, 6-9 and 12-15, there is no suggestion or motivation for combining the Rose et al. '944 patent with the Newman '250 patent, the Kinrot et al. '407 patent and Japanese Patent 404021255A. The arguments set forth describing the lack of suggestion or motivation for combining the Rose et al. '944 patent with the Newman '250 patent, the Kinrot et al. '407 patent and Japanese Patent 404021255A apply to a combination of the Rose et al. '994 patent, the Newman '250 patent, the Kinrot et al. '407 patent, Japanese Patent 404021255A and the Kashiwagi et al. '944 patent, and is hereby incorporated regarding the rejection of claims 4, 5, 10, 11, 16 and 17.

Furthermore, there is no suggestion or motivation for combining the teachings of the Kashiwagi et al. '944 patent and the four patents discussed above. According to the Office Action "[i]t would have been obvious to include the teachings of Kashiwagi line sensor in the Rose and Omura [Japanese Patent 404021255A] combination in order to measure the amount of movement of an object in non-context fashion accurately." The Applicant submits that the modification as set forth in the Office Action would not improve the accuracy of any measurement and therefore there is no suggestion or motivation for making the modification as set forth in the Office Action. Applicant notes that it is impermissible within the framework of §103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art. *In re Wesslau*, 353 F.2d 238, 241, 147 USPQ 391, 393 (CCPA 1965); see also *In re Mercer*, 515 F.2d 1161, 1165-66, 185 USPQ 774,778 (CCPA 1975). Accordingly, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the

art, to combine the reference teachings. Therefore, claims 4, 5, 10, 11, 16 and 17 are in condition for allowance.

In regard to the third criterion of obviousness, the prior art references when combined do not teach or suggest all of the claim limitations. All of the claims define a lensless method (claims 1 and 7) or a lensless apparatus (claims 2-6 and 8-17). The Kashiwagi et al. '944 patent discloses a cylindrical tube 31 that has a lens system 32 and a line sensor 33 thereon. See lines 14 and 15 of column 5. Therefore, if the cylindrical tube 31 as disclosed in the Kashiwagi '944 patent is used in a combination, the resulting combination would include a lens system. Accordingly, the combination including the cylindrical tube 31 as disclosed by the Kashiwagi et al. '944 patent as set forth in the Office Action would not include a lenseless method (claims 1 and 7) or a lenseless apparatus (claims 2-6 and 8-17). Once again, Applicant notes that it is impermissible within the framework of §103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art. *In re Wesslau*, 353 F.2d 238, 241, 147 USPQ 391, 393 (CCPA 1965); see also *In re Mercer*, 515 F.2d 1161, 1165-66, 185 USPQ 774,778 (CCPA 1975). Therefore, claims 4, 5, 10, 11, 16 and 17 are in condition for allowance.

Accordingly, claims 4, 5, 10, 11, 16 and 17 are allowable over the Rose et al. '994 patent in view of the Newman '250 patent, the Kinrot et al. '407 patent, Japanese Patent 404021255A and the Kashiwagi et al. '944 patent, and the Board is requested to reverse the rejection of these claims.

IX. Conclusion

Each appealed claim recites features that are not disclosed by any of the cited references and it would not have been obvious to modify the cited references to include the recited features of the appealed claims. The references upon which the Examiner relies in the Examiner's rejections of the finally rejected claims does not disclose or suggest a lensless system, moving an object towards or away from a sensor, or providing an apparatus that measures the movement of

an object as set forth in the finally rejected claims. Applicant's invention resolves problems and inconveniences experienced in the prior art, and therefore represents a significant advancement in the art. Applicant earnestly requests that the Examiner's final rejection of claims 1-17, inclusive, be reversed, and that the application be passed to issuance forthwith.

Respectfully submitted,
KENICHIRO KOBAYASHI

By: Price, Heneveld, Cooper, DeWitt & Litton

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Date

Marcus Dolce

Marcus P. Dolce
Registration No. 46 073
695 Kenmoor, S.E.
Post Office Box 2567
Grand Rapids, Michigan 49501
(616) 949-9610

MPD/msj

Appendix of Claims (37 CFR §1.192(c)(9))

1. (Amended) A lensless method for measuring the amount which an object to be measured has moved in a plane and back-and-forth using a granular speck pattern generated by a reflecting laser beam in non-contact fashion comprising steps of:

irradiating an object to be measured with a laser beam;

directly detecting the granular speck pattern generated by the reflecting laser beam by a detector and using the detected speck pattern as an index;

moving the object toward or away from the detector;

calculating the amount of movement of the object based upon the movement of a new granular speck pattern corresponding to the moved position of the object with respect to said index; and

displaying a result of the calculation as a numerical value of the measured amount of movement.

2. (Amended) A lensless apparatus for measuring the amount which an object to be measured has moved in a plane and back and forth using a granular speck pattern generated by a reflecting laser beam, said apparatus comprising:

a laser projector to generate a granular speck pattern corresponding to a rough surface of an object to be measured;

a line sensor to directly pick up without a lens said granular speck pattern used as an index;

an A/D converter coupled to said line sensor to convert an analog signal supplied from said line sensor to a digital signal;

a processing unit coupled to the A/D converter to calculate the amount of movement of said object toward and away from said sensor on the basis of movement of the granular speck in said pattern with respect to a change in the pixel interval of said granular speck pattern picked up by said line sensor and represented by said A/D converted signal; and

a display coupled to said processing unit to display the amount of movement calculated by said processing unit.

3. (Amended) The apparatus as defined in claim 2 and further including a light shield positioned in front of said line sensor.

4. The apparatus as defined in claim 3 wherein said line sensor comprises a tube.

5. The apparatus as defined in claim 4 wherein said tube is cylindrical.

6. (Amended) A lensless apparatus for measuring the amount which an object to be measured has moved in a plane and back and forth using a granular speck pattern generated by a reflecting laser beam, said apparatus comprising:

a laser projector for generating a granular speck pattern corresponding to the surface of an object to be measured;

a line sensor positioned to detect directly without a lens said granular speck pattern as an index; and

an electrical circuit coupled to said line sensor for calculating the amount of movement of said object toward and away from said sensor on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern picked up by said line sensor and displaying the amount of movement calculated by said processing unit.

7. (Amended) A lensless method for measuring the amount which an object to be measured has moved by detecting a granular speck pattern reflected by a laser beam comprising steps of:

irradiating an object to be measured with a laser beam;

directly detecting a granular speck pattern generated by the reflecting laser beam by a detector and using the detected pattern as an index;

moving the object with respect to said detector;

calculating the amount of movement of the object based upon movement of the granular speck pattern corresponding to the moved position of the object with respect to said index; and

displaying a result of the calculation as a numerical value of the measured amount of movement.

8. (Amended) A lensless apparatus for measuring the amount which an object to be measured has moved using a granular speck pattern generated by a reflecting laser beam, said apparatus comprising:

a laser source for generating a granular speck pattern corresponding to a rough surface of an object to be measured;

a line sensor positioned to detect directly without a lens said granular speck pattern as an index;

a processing unit coupled to said line sensor to calculate the amount of movement of said object on the basis of movement of a granular speck in said granular speck pattern with respect to a pixel interval of said granular speck pattern detected by said line sensor; and

a display coupled to said processing unit to display the amount of movement calculated by said processing unit.

9. (Amended) The apparatus as defined in claim 8 and further including a light shield positioned in front of said line sensor.

10. The apparatus as defined in claim 9 wherein said line sensor comprises a tube.

11. The apparatus as defined in claim 10 wherein said tube is cylindrical.

12. The apparatus as defined in claim 8 and further including an A/D converter coupled to said line sensor to convert an analog signal supplied from said line sensor to a digital signal.

13. (Twice Amended) A lensless apparatus for measuring the amount which an object to be measured has moved in a plane and back and forth using a granular speck pattern generated by a reflecting laser beam, said apparatus comprising:

a collimated light source for generating a granular speck pattern corresponding to the surface of an object to be measured;

a line sensor positioned to detect directly without a lens said granular speck pattern as an index; and

an electrical circuit coupled to said line sensor for calculating the amount of movement of said object on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern picked up by said line sensor and displaying the amount of movement calculated by said electrical circuit.

14. The apparatus as defined in claim 13 wherein said collimated light source is a laser.

15. (Amended) The apparatus as defined in claim 14 and further including a light shield positioned in front of said line sensor.

16. The apparatus as defined in claim 15 wherein said line sensor comprises a tube.

17. The apparatus as defined in claim 16 wherein said tube is cylindrical.